2006 Draft Integrated Resource Plan Executive Summary

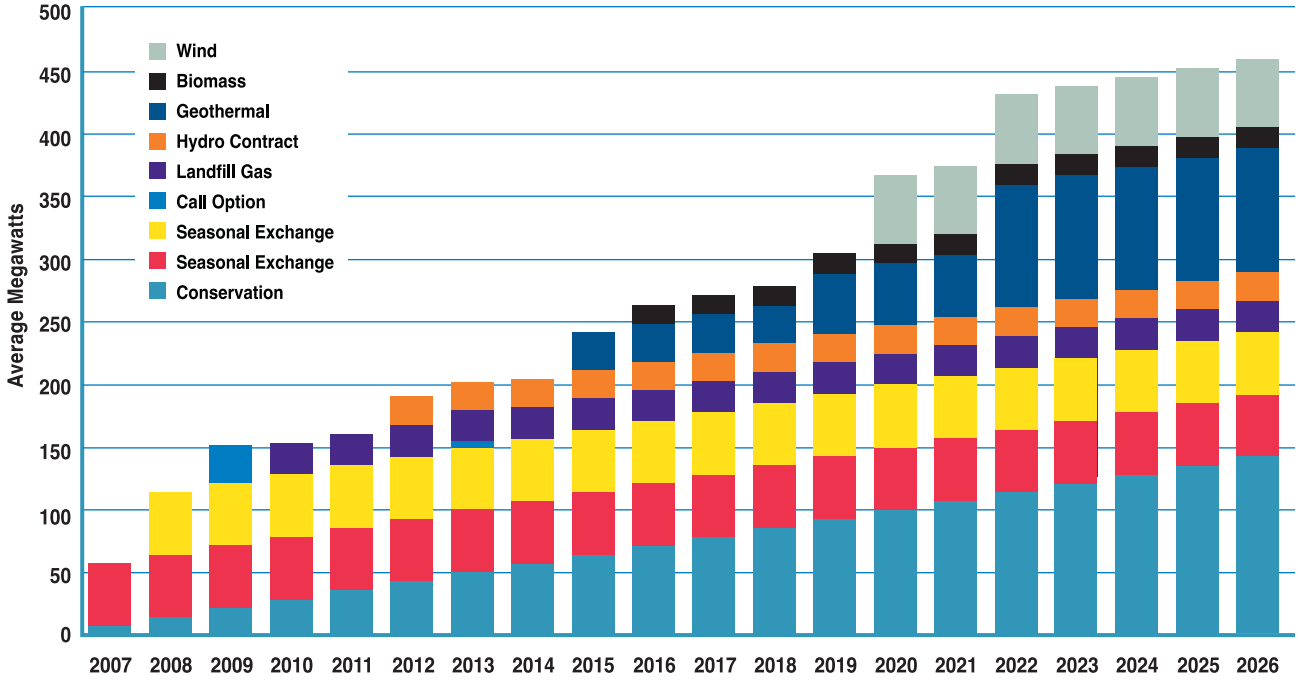
Mayor's Recommended Resource Strategy

Based upon the Integrated Resource Plan (IRP) development process, the Mayor recommends a long-range resource acquisition strategy that:

- Invests in cost-effective conservation for the next 20 years.
- Institutes cost-effective seasonal power exchanges, beginning in the near term.
- Exercises City Light's preference rights for the purchase of low-cost power from the Bonneville Power Administration in a new contract beginning in 2011.
- Plans for the near- to mid-term purchase of output from low-cost renewable resources such as a new landfill gas project and a small existing hydro project.
- Acquires output from other renewable resources such as wind and geothermal, beginning in about 2015, in compliance with State Initiative 937.

This course of action, illustrated below, is an extension of the Utility's history of obtaining low-cost power with low environmental impacts for its ratepayers/owners. Conservation is the first resource of choice, followed by seasonal exchanges that help shape resources to load. Market-based purchases have a place when there is a resource need but not enough justification for acquiring new resources. When new resources are needed, the lowest-cost renewable resources are acquired first, followed by higher-cost renewable resources. City Light expects its access to low-cost federal power will be locked in for 20 years, beginning in 2011.

Mayor's Preferred Alternative



Integrated Resource Planning Process

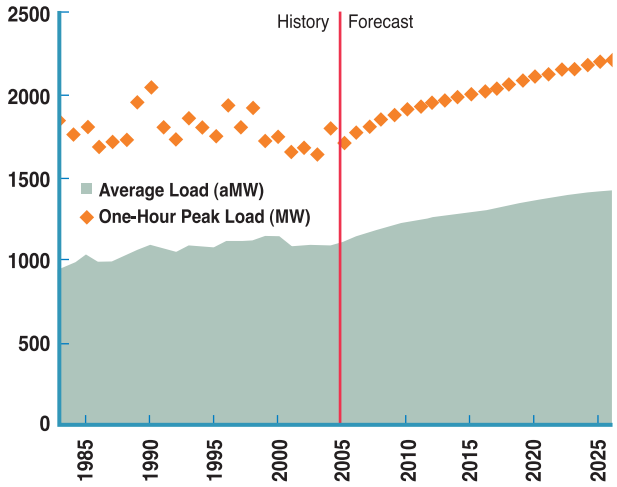
The Mayor's recommendation is the culmination of a process that included these steps:

- Involving the public, including citizens and stakeholders with diverse perspectives.
- Recruiting expertise from within and from outside the Utility.
- Licensing and installing a sophisticated computer model for power planning.
- Calibrating the model for the characteristics of City Light's complex hydroelectric operations and purchase power contracts.
- Thoroughly assessing conservation resource potential in the service area.
- Forecasting customer demand for power each month through 2026.
- Developing a resource adequacy measure, crucial for defining the timing and amount of future need.
- Developing costs and characteristics of alternative resources to be included in the candidate resource portfolios.
- Constructing and modeling Round 1 candidate resource portfolios for evaluation against four criteria: reliability, cost, risk and environmental impacts.
- Issuing a Draft Environmental Impact Statement (DEIS) for Round 1 portfolios.
- Constructing and modeling Round 2 candidate resource portfolios, based on findings and comments in response to Round 1.
- Recommending a resource strategy and near-term resource action plan.
- Issuing a final EIS.

Load Forecast and Resource Adequacy

A first step in assessing the need for additional resources is a forecast of future need, taking into account both the load forecast and the desired level of resource adequacy. The Utility's long-range forecast projects continued load growth for the service area. The graph below shows the load forecast assuming no new programmatic conservation, because the IRP treats conservation as a resource and evaluates it in the same way as other resources.

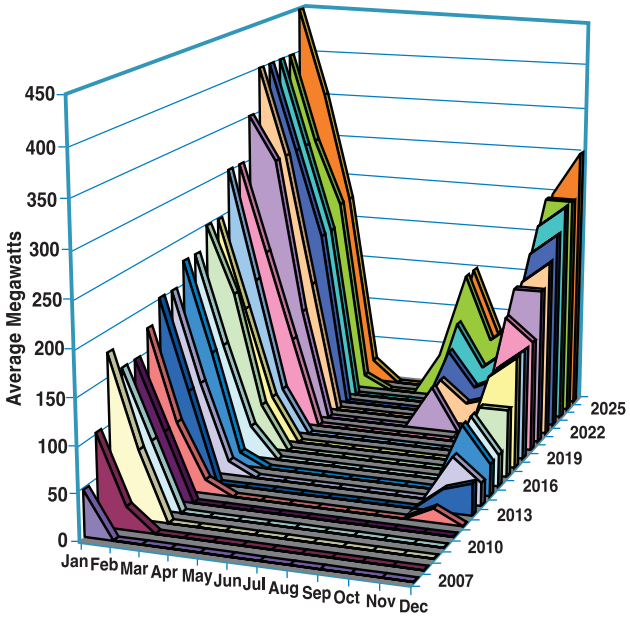
System Annual Load History and Forecast
(with no new conservation program resources)



City Light is dedicated to providing a high level of resource reliability. This includes the ability to serve load even when generation capability is low. Low generation capability is usually due to drought conditions in the Pacific Northwest. The greatest threat to City Light's resource reliability is the combination of low water and high customer demand for power. High customer demand is usually due to extreme low temperatures in the winter. The IRP relies on a measure of resource adequacy that ensures that the Utility has a 95 percent confidence level of meeting loads in any given January (the highest demand month).

Using the 95 percent resource adequacy measure and assuming that 100 average megawatts of power can be purchased from the spot market, modeling the operation of City Light's existing resource portfolio shows that the Utility needs additional resources in the winter of 2007. This need increases through time as load grows and as existing contracts expire. By 2026 the need for power in the winter grows to 450 average megawatts in the winter and 200 average megawatts in the summer. The timing and amount of resource need is shown on the graph below.

95% Resource Adequacy: Projected Gap between Load and Resources



Policy Direction

The policies most germane to the Utility's Integrated Resource Plan are the recently passed Washington State Initiative 937 and Seattle City Council Resolutions 30144 and 30359.

Resolution 30144 (2000) and the Mayor's Climate Action Plan direct the Utility to meet load growth with conservation and renewable resources. Resolution 30144 also directs City Light to mitigate for greenhouse gas emissions from any fossil fuel use, and sets a long-term goal of "Net Zero" annual greenhouse gas emissions, which City Light achieved in 2005.

The Greenhouse Gas Mitigation Strategy Resolution 30359 (2001) sets standards for calculating greenhouse gas emissions and mitigation projects. The climate change policy does not prohibit City Light from acquiring electricity from resources that produce greenhouse gas, but does require the Utility to fully offset those emissions.

Initiative 937 requires utilities with more than 25,000 customers to acquire cost-effective conservation and to serve load with increasing percentages of renewable power. The intent of the initiative is consistent with existing City policy, though specifics of the legislation will likely have an impact on the timing and exact amount of conservation and renewable resource acquisition. The Mayor's preferred resource strategy complies with the City's interpretation of the initiative.

Existing Resource Portfolio

The existing portfolio includes conservation, generation resources and market resources. For nearly 30 years, City Light policy makers have been unwavering in their commitment to conservation as a resource. Generation resources include low-cost City Light-owned hydroelectric projects, power purchased at preference rates from the Bonneville Power Administration (BPA), and contract purchases from other entities. The Utility supplements these resources with power exchange agreements and purchases made in the wholesale power market.

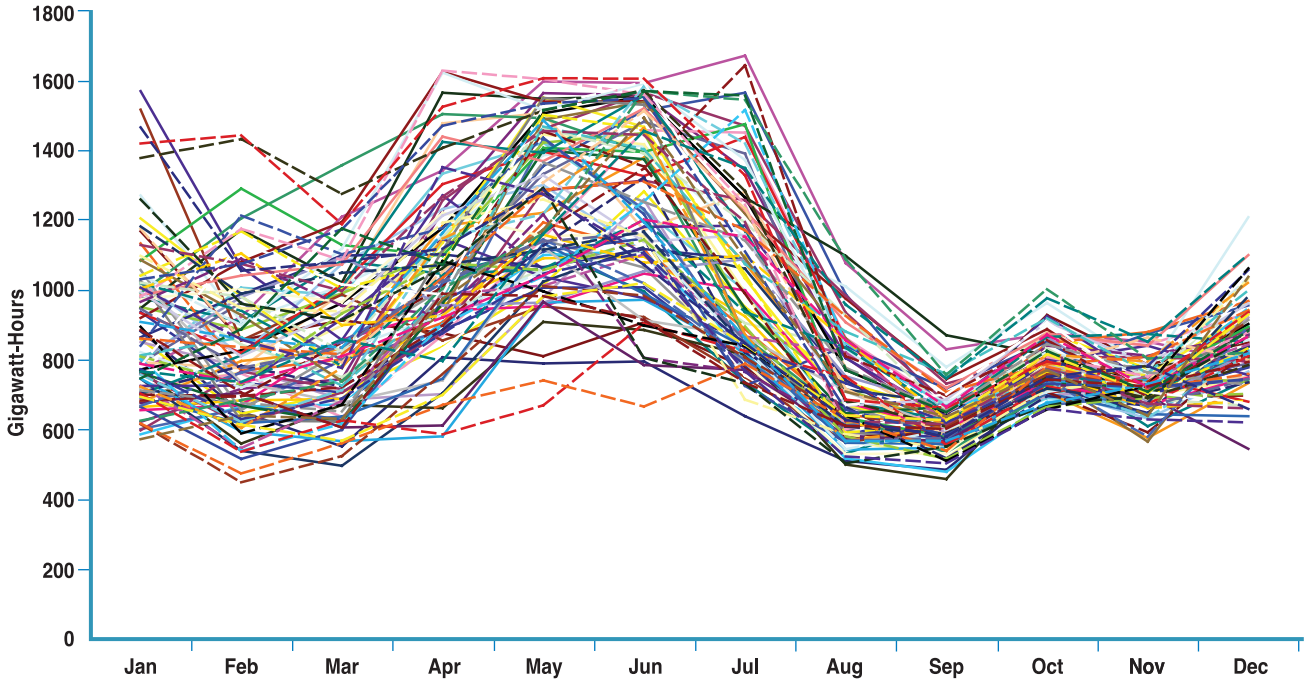
Most of City Light's power is generated by its own low-cost hydroelectric facilities, located mainly in Washington. City Light added wind power to its portfolio in 2002, with the signing of a 20-year contract for the purchase of output from the Stateline wind project in eastern Washington and Oregon. The following map shows the location of City Light's generation resources.

City Light Generation Resources

Characteristics of the existing resource portfolio influence the choice of resource additions. The two dominant characteristics are hydro variability and monthly shape. The monthly shape of generation from the existing portfolio is not in synch with service area load. Load is highest in winter, but generation is highest in late spring. This suggests the use of strategies that have the effect of reshaping generation to load. Properly constructed seasonal exchanges can accomplish this.

Hydro variability refers to the very broad range of generation capability that is determined by precipitation. Managing this variability is a challenge. The graph on the following page illustrates hydro variability, based on historical weather conditions and current river regulation. The Utility's challenge is to ensure that there are sufficient resources to provide the power needed by its customers under drought conditions, even when winter temperatures are very low. On the other hand, the Utility needs to try not to acquire too much surplus power, to avoid the risk of being unable to sell the surplus at prices that cover costs. The Utility's purpose is to serve its customers' need for electric power.

Variability in Hydro Generation



Climate Change

The IRP contains a discussion of potential impacts of climate change on hydro operations. A substantial effort to analyze climate change in the Northwest is underway using a computer model being developed by the University of Washington Climate Change Group. City Light is providing funding to bring this large scale modeling down to a level that can capture the unique nature of the major watersheds City Light relies on for hydro power. BPA and the Northwest Power and Conservation Council may pursue similar studies for the Columbia River System. City Light will continue to evaluate climate change impacts, incorporating new data as it becomes available.

Although climate change data is not yet available for all the hydropower systems from which City Light receives power, the hydro distributions for the output of the Skagit system that were used in the IRP model did include the range of extreme flow conditions that have been predicted by climate change models. The input data was based on historical data, but was not limited strictly to the recorded extremes. This approach allowed planners to see how the extremes (both lower and higher flow conditions) would effect the various resource portfolio options in terms of reliability, cost and risk.

Resource Choices

The three main categories of resources are conservation, generation and the wholesale power market. Generation resources can be further categorized as renewable and non-renewable. Many resource types were evaluated in Round 1, but the refinements of Round 2 eliminated nearly all non-renewable resources.

Conservation

City policy guidance and State Initiative 937 require the acquisition of cost-effective conservation. Certain conservation measures can improve load shape because their greatest effect in is the winter when it is cold and dark. Conservation also has the benefit of avoiding transmission costs. The conservation resource was the mainstay in both rounds of portfolio analysis, which examined both constant and accelerated paces of acquisition.

Market

The wholesale power market provides opportunities for seasonal exchanges and market purchases. Seasonal exchanges are low in cost and can help shape resources to load. Physical call options are useful for meeting a high demand that has a low probability of occurring. Both exchanges and call options are low-cost ways of meeting seasonal demand without the expense of acquiring new generation.

Renewable Generation

Renewable resources satisfy the need for power and avoid air and water pollution that endangers the environment and human health. Renewable resources could become even more advantageous with the eventual imposition of a carbon tax. Initiative 937 encourages the development of such resources, though the availability of transmission could be a problem. The cost of transmission for wind resources is especially high because transmission must be available even when the wind is not blowing. Other renewable resources likely to be available to City Light in the near term are landfill gas, geothermal and biomass.

Non-Renewable Generation

Non-renewable resources are generally fossil fuels such as coal, oil and natural gas. Their emission of greenhouse gases and air pollutants has significant impacts on the environment and human health and the necessity of mitigation makes them costly. Natural gas resources can be sited close to load and would require little in the way of transmission upgrades, while resources remote to load, such as coal, would require significant transmission, further increasing their cost.

Most fossil fuel resources have an advantageous generation profile that allows them to meet Utility customers' base energy requirements and frees up the hydroelectric resources to follow load. The only fossil fuel resource that can effectively follow load is the natural gas simple-cycle combustion turbine that can be used to meet peak load requirements or to operate during the hours preceding the peak hour, thus saving water to meet the peak requirements. Such a resource was examined.

Methodology for Analyzing Portfolios

The candidate portfolios were tested within the Reference Case developed by Global Energy Decisions (GED). The Reference Case gives forecasts of:

- Electric power prices
- Natural gas prices
- Installed capacity in the Pacific Northwest market
- Customer load for the Pacific Northwest market

The interplay of these four factors defines the power market in which the City Light is likely to be operating over the next 20 years. The IRP analysis also considered GED's four alternative scenarios that incorporate varying assumptions about the direction of the national economy and environmental legislation.

The model used for analyzing the portfolios simulated their operation based on the operating characteristics of each resource and its total cost, including fuel, operations and maintenance, and transmission. The amount of greenhouse gas emissions and air pollutants was also calculated. Costs were assigned to these emissions and considered along with other portfolio costs.

At any particular point in time, the least-cost resource is picked first, followed by the next least-cost resource, and so on, until load for that point in time is met. The portfolios were then evaluated using these four criteria:

- **Reliability.** All portfolios were designed to meet the 95 percent resource adequacy measure, but they vary in the degree of their reliance on total market purchases over 20 years.
- **Cost.** The net present value (NPV) of cash flows over 20 years were calculated and compared.
- **Risk.** The sources of risk are uncertainty about fuel prices and the market price of power, whether buying or selling. The portfolios varied in their exposure to these sources of uncertainty. The measures for comparison of the portfolios were the coefficient of variation for net operating revenues and costs over 20 years.
- **Environmental impact.** A thorough analysis of potential environmental impacts was completed, and Draft and

Final Environmental Impact Statements were prepared. CO2 emissions impacts were assigned costs that were taken into account in the 20-year net present value calculations. Total greenhouse gas emissions over 20 years were calculated and compared for all portfolios.

Round 1 Analysis

Candidate portfolios were analyzed in two rounds. Round 1 portfolios were primarily exploratory and included a broad range of resources. Round 1 provided an opportunity for testing the limits of the model and for gaining insights into how it operated. Nine portfolios were modeled in Round 1. The main conclusions from Round 1 were that:

- Large capacity baseload generation technologies exacerbate the mismatch between the Utility's load shape and resource shape.
- Large un-scalable projects leave the Utility with decreasing oversupply in early years and increasing undersupply in later years.
- Heavy polluters are too costly, given the City's policies on offsetting carbon emissions (CO2) and accounting for environmental externalities (emissions of sulfur dioxide and nitrogen oxides, particulate matter and mercury).
- Large resources that are remote to load require expensive new transmission facilities.
- Seasonal energy exchanges are inexpensive and help match resources to load, though transmission availability may be a limiting factor.
- Cost-effective conservation remains the resource of choice and should be the mainstay of any portfolio.
- Reducing City Light's Slice product from the Bonneville Power Administration in favor of more Block product is not an advantageous strategy.

Round 2 Analysis

The Round 2 analysis was conducted before the passage of Initiative 937, so both compliant and non-compliant portfolios were constructed and evaluated. The Round 2 portfolios are the same in the near-term, similar in the mid-term, and differ mostly in the long-term, as summarized below:

- **Near-term.** By Round 2, it was clear that in the earliest years, seasonal exchanges and physical call options could shore up reliability in the winter at little cost. All Round 2 portfolios add conservation, seasonal exchanges and seasonal capacity contracts (call options) through 2009.
- **Mid-term.** After 2010, new generation resources are needed. The Round 2 portfolios feature the addition of varying combinations of a landfill gas resource and a small hydro contract for an existing project in the region. These are in addition to conservation, seasonal exchanges and call options.
- **Long-term.** Around 2015, different combinations of wind, geothermal, biomass and a single-cycle combustion turbine are added to meet growing load and to take the place of expiring contracts, primarily the Stateline wind contract which ends in 2021.

The Round 2 portfolios have two primary distinguishing features: compliance with Initiative 937 requirements for renewable resources, and the pace of conservation acquisition:

- Two portfolios (P4 and P5) do not comply with I-937 in the amount of renewable resources acquired. They feature the constant rate of conservation acquisition.
- Two portfolios (P7 and P8) do comply with I-937 in the amount of resources acquired. They also feature the constant rate of conservation acquisition.
- Three portfolios (P2, P3, P6) do comply with I-937 in the amount of resources acquired. They feature an accelerated rate of conservation acquisition between 2010 and 2020. Conservation acquisition would then decline steeply between 2021 and 2026, after all projected lost opportunities and retrofits are exhausted.

While Portfolios 4 and 5 are the least costly of the portfolios evaluated, they were eliminated from further consideration after passage of Initiative 937 because they would not meet the minimum renewable resource acquisition requirements. The remaining portfolios are compliant in renewable resources, but differ in their rate of conservation acquisition. Otherwise, they are similar until 2015, when they are distinguished by the mix and timing of varying amounts of renewable resources – wind, geothermal and biomass.

Portfolio Comparison

	Portfolios 2007-2026	20 Year NPV of Costs ($1000's)	Variable Cost Risk (CV)	20-Year Tons of CO2	Meets 95% Reliability Criterion
P2	Geo100 Wind55 Hydro23 LFG25 Bio15, Accel Conservation	$ 58,838	77%	1,967,686	Yes
P3	Geo125 Wind50 LFG25 Hydro23, Accel Conservation	$ 68,910	77%	1,967,686	Yes
P4	Geo50 Ex40 SCCT50 LFG25 Hydro23, 7aMW Conservation	($ 54,846)	81%	2,245,312	Yes
P5	Geo75 Ex45 LFG25 Hydro23 Wind20, 7aMW Conservation	$ 16,426	81%	1,695,872	Yes
P6	Geo120 Wind50 LFG25, Accel Conservation	$ 57,499	79%	-712,067	Yes
P7	Wind105 Geo50 Bio15 Hydro23 LFG25, 7aMW Conservation	$218,231	79%	1,732,147	Yes
P8	Geo100 Wind55 Bio15 Hydro23 LFG25, 7aMW Conservation	$170,936	80%	1,732,147	Yes

The table above illustrates how the Round 2 portfolios performed on the measures of reliability (95 percent resource adequacy), cost (20-year NPV), risk (coefficient of variation) and environmental impact (CO2 emissions).

On the cost criterion, the portfolios "without I-937" (P4 and P5 in red) outperform the portfolios "with I-937". There are two reasons for this. Initiative 937 requires purchases of resources beyond those needed to meet the 95 percent resource adequacy criterion after 2015. The I-937 requirement has no relationship to resource need. Also, I-937 limits the eligibility of some types of resources.

City Light hypothesized that accelerating discretionary conservation may reduce the costs of complying with Initiative 937. The initiative requires purchases of eligible renewable energy as a fixed percentage of retail load. If the pace of acquisition of conservation is accelerated, retail load is reduced, delaying the need for future resource additions. The results showed that the portfolios "with I-937, accelerated conservation" (P2, P3, P6 in yellow) outperformed the portfolios "with I-937, constant conservation" (P7 and P8 in green).

This suggests that a more aggressive conservation acquisition schedule may result in lower cost, partially because it reduces load, which is the basis for determining resource additions under Initiative 937. The amount of benefit by accelerating conservation programs may be substantial. In the analysis performed for this IRP, as much as half the difference in costs between the "with I-937" portfolios and the "without I-937" portfolios could be cut.

Further study is required before a conceptual "with I-937, accelerated conservation" portfolio is adopted. The accelerated conservation portfolios evaluated for this IRP are conceptual because of uncertainties about feasibility and costs. For purposes of the analysis, the same unit cost of conservation was used in the accelerated cases as in the constant case. This is an important assumption that, when altered, could reduce the attractiveness of accelerated conservation.

Nevertheless, a conceptual investigation of accelerating conservation can give useful information about strategic direction. The possible benefits of conservation acceleration under Initiative 937 strongly suggest that further study of program costs and feasibility should be conducted.

Recommendations

The Mayor's recommended resource strategy, shown in the table below, calls for:

- Continued acquisition of cost-effective conservation.
- Two low-cost seasonal exchanges to shape resources to load.
- Seasonal capacity contracts (physical call options) when advantageous.
- Output from a landfill gas facility.
- Output from an existing regional hydro facility.
- Increasing amounts of output from a regional geothermal resource.
- Output from a small local biomass facility.
- Output from a regional wind farm.

The Mayor further recommends that the Utility:

- Study the costs and benefits of accelerating the rate of conservation acquisition.
- Be given the authority to negotiate and purchase seasonal capacity contracts (physical call options).
- Pursue the low-cost strategy of long-term seasonal exchange agreements, given the current resource surplus in the West.
- Further investigate the impacts of climate change on long-term resource planning.
- Pursue acquisition of the output of a landfill gas facility.
- Continue honing its ability to evaluate the risk aspects of resource choices in the 2008 IRP.

The Mayor's recommended action plan is shown on the following page.

Preferred Alternative

Resource (aMW)	Location	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Conservation	W. WA	7	14	21	28	36	43	50	57	64	71	78	85	93	100	107	114	121	128	135	142
Seasonal Exchange	Mid-C	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
Seasonal Exchange	Mid-C		50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
Call Option	Mid-C			30				5													
Landfill Gas	W. WA				25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
Hydro Contract	Mid-C						23	23	23	23	23	23	23	23	23	23	23	23	23	23	23
Geothermal	W. WA									30	30	30	30	50	50	50	100	100	100	100	100
Biomass	W. WA										15	15	15	15	15	15	15	15	15	15	15
Wind	E. WA														55	55	55	55	55	55	55
Total		57	114	151	153	161	191	203	205	242	264	271	278	306	368	375	432	439	446	453	460

IRP Action Plan, 2007-2008

Actions	2007	2008
Conservation Resources		
Acquire cost-effective conservation in the targeted amounts.	7 aMW by end of 4th Qtr	7 aMW by end of 4th Qtr
Investigate methods and costs of accelerating conservation resources.	Investigate delivery costs and methods by year end	Include in IRP
Generation Resources		
Investigate costs and availability of planned resources, including landfill gas and geothermal.	Go/no go decision on landfill gas by year end.	Negotiate contracts as needed.
Market Resources		
Investigate and acquire seasonal exchanges and/or seasonal market purchases to offset near-term reliability risk.	Additional 50 aMW as needed	Additional 50 aMW as needed
Other New Resources		
Collect and update information on costs of a wide range of new resources commercially available by June 2008.	Ongoing	Finalize assumptions by May for 2008 IRP
Investigate the development status, costs and commercial availability of new resource technologies.	Ongoing	Ongoing
Investigate the cost-effectiveness of hydro efficiency measures and other steps to improve Skagit output.	Further investigate Gorge Tunnel economics	Decision on inclusion in 2008 portfolios
Transmission		
Work to ensure adequate transmission to support reliable service to existing and future load needs.	Ongoing	Ongoing
Future IRPs		
Continue to refine assumptions, forecasts and modeling.	Ongoing	Ongoing
Monitor development of regional resource adequacy standards.	Ongoing	Ongoing
Assess the impacts of climate change on operations and load in greater depth.	By year end	Reflect in 2008 IRP
Evaluate distributed generation opportunity and distribution savings potential.	Conclusions by year end	Incorporate conclusions into 2008 IRP
Update the demand outlook and estimate of resource adequacy.	Results by year end	Use demand forecast for 2008 IRP
Prepare IRP Update and any EIS update.	Initiate studies and investigations listed above.	Complete 2008 IRP
File IRP with the Department of Community, Trade and Economic Development (CTED) according to administrative rules.		File IRP by September 2008